

# PV Design Assistance Center Collaborations and Technical Assistance

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## ABSTRACT

The message that clean, reliable energy can be harvested from the sun has rarely been as powerful as when it comes from a credible national research and development laboratory to a group of potential facilitators and end users. For nearly two decades Sandia National Laboratories has been a source for important technical information about solar electricity. Historically, that valuable technical assistance has been transmitted to state and federal agencies, international funding agencies, the PV industry itself, designers and architects and utilities, and many others involved in the promotion, purchase, and ultimate use of photovoltaic systems. Sandia's PV Design Assistance Center remains key in the transmission of information that fosters the installation of sustainable PV systems.

### **1. The Message: Systems Engineering Technical Assistance is Essential for Ensuring Successful Installations**

Good system design – which means an overall systems engineering perspective from the outset – is the core element of the technical assistance transmitted through the PVDAC. This technical assistance is disseminated through a variety of means, not the least of which are hundreds of telephone inquiries annually from engineers, architects, the Department of Defense, and federal facility staffs at the National Park Service, the USDA Forest Service, the Bureau of Land Management, and others.

The PVDAC is a national resource for technical information about PV systems, a fact validated by their involvement in most of the major PV systems installed in the United States during the first decade of the Center's existence, and the continuing demand for this level and quality of technical assistance.

### **2. The Ways and Means: Avenues for Dissemination of Technical Information**

The media through which the technical assistance is transmitted has burgeoned as the world wide web has grown. Sandia National Laboratories' photovoltaics web site receives more than 250,000 hits every month and has experienced a sustained, high growth rate since statistics began to be collected in 1997. Not only has the technical information woven into the large site been accessed, but dozens of technical and general interest publications about photovoltaics have been accessed online and often downloaded. At a very large national laboratory, it is no

small measure of success that technical documents about photovoltaics are consistently among the most frequently downloaded documents throughout the laboratory. Interest in PV outpaces interest in wind, concentrating solar, or any other renewable energy technology, due to the breadth, depth, and high quality of the technical information created by the PVDAC staff at Sandia.

Another highly visible way that the PVDAC transmits technical information is through its collection of systems engineering manuals and guides. These documents were written for a varied readership – everyone from an individual homeowner interested in installing a stand-alone PV system to a large utility interested in evaluating the benefits of PV for their small power needs to a large cadre of union electricians interested in understanding how PV complements elements of the National Electrical Code. More than 10,000 technical, print documents are distributed every year from a list of about 20, which cover the installation, maintenance, and operation of both stand-alone and grid-connected PV, codes and standards, safety issues, and more. Several are available in both English and Spanish.

Yet another successful means for transmitting technical information about PV systems occurs when Sandia's systems engineers help agencies develop sound procurements, assist customers by providing engineering design reviews, provide advice on component compatibilities, educate their technical counterparts on load ratios, and every other piece of information essential for a successful system installation. One way in which this assistance is provided is through site visits where in-depth analyses of potential applications are the result. PVDAC feedback about the appropriateness of PV, its technical and economic characteristics, and its financing has been invaluable.

Training programs, conferences, and workshops supported by the PVDAC round out the primary avenues through which systems engineering and technical assistance about PV is disseminated: Gatherings with limited audiences, such as water pumping workshops and module durability sessions; meetings with singular audiences, such as briefings and technical tours for the national corps of BP Solar marketers and distributors; large inclusive forums at, for example, Sandia's annual Photovoltaics Systems Symposiums; or intimate settings where PVDAC staff help the Navajo Tribal Utility Authority convene end-users' training in the remote Kayenta District of northern Arizona. Staff are often asked to participate as experts on technical panels at workshops and conferences. And every year hundreds of

electricians and installers hear traveling sessions on PV and the National Electrical Code. These are illustrative of the wide range of beneficiaries of PVDAC's technical training program.

The expertise found within the Photovoltaic Design Assistance Center at Sandia is available to all of the customers mentioned above, and in the myriad of ways mentioned, often at no cost. Generally speaking, it is only when extensive technical studies are necessary that an agreement is reached whereby customers receive this essential information for a fee. A few examples of the kinds of services that have generated revenue for the PVDAC would include the analysis of PV as a power source for remote irrigation, a report to the U.S. Bureau of Reclamation; testing of solar cells and modules for industry partners; and a gamut of PV design, performance, and follow-up studies for the Department of Defense.

An important by-product of recent interactions with, for example, both the Navajo Nation and rural electric cooperatives has been that performance and reliability data collection activities have either been honed to the extent that valuable reliability information can populate Sandia's reliability database, or deficiencies in how performance and reliability data are collected have been identified. The end result has been that whenever the PVDAC has assisted with not only quantitative and qualitative measurements and data collection, but also with the infrastructure issues associated with such collection, valuable lessons have been learned.

As can be seen, these collaborations can exist with state and federal agencies, with educational institutions, with the PV industry itself, and with American Indian tribes. It is important to point out that the technical assistance proffered through the PVDAC is often performed in partnership with the Southeast Regional Experiment Station (Florida Solar Energy Center) and

Southwest Regional Experiment Station (Southwest Technology Development Institute). In every meaningful way, these two institutions are a vital component of the PVDAC collaborative venture.

### **3. PVDAC and its Role in the National Mission**

Even a cursory reading of the U.S. Department of Energy's Five-Year Plan [1] and the PV Industry's Roadmap [2] illustrate the demand for, and the driving forces for, a continuing role for the PVDAC within the national photovoltaics program. Phrases such as "support broad outreach," "support codes, standards, and certification," and "fully develop outreach, training, and public awareness programs" substantiate the need for PVDAC-type activities. Helping to remove technical barriers, sharing common technical problems, producing the body of knowledge that helps formulate government policy -- even concentrated efforts on new applications for photovoltaics -- all contribute to fulfilling the goals of the national PV program.

### **4. Acknowledgements**

This work is supported by the U.S. Department of Energy under Contract DE-AC04-94AL85000. Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the U.S. Department of Energy.

### **5. References**

- [1] U.S. Department of Energy, *Photovoltaics: The Power of Choice*, the National Photovoltaics Program Plan for 1996-2000.
- [2] *Solar Electric Power: The U.S. Photovoltaic Industry Roadmap*, produced and printed by the photovoltaic industry, April 2001.